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REMEDATION PLAN
DIESEL CONTAMINATION IN SOILS AND GROUNDWATER
CSXT RADNOR YARD FACILITY
RECEIVED
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RCI Project No. 8-4386.00

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1.0 PURPOSE AND SCOPE

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This remediation plan has been prepared by Resource Consultants, Inc. (RCI) on behalf of CSX Transportation (CSX) in order to comply with requirements of National Pollution Discharge Elimination System (NPDES) Permit Number TN0064955. Provisions of the NPDES permit require notification of the Division of Water Pollution Control in the event of the discovery of groundwater or soil contamination and submission of a remediation plan.

On September 30, 1994, notification of soil contamination was transmitted to the Division of Water Pollution Control. Subsequent to this notification, free product was discovered in an exploratory well located near the area of soil contamination. This remediation plan has been prepared to address both soil and groundwater contamination associated with the specific areas of the facility where the reported contamination was discovered.

As stipulated in the NPDES permit, this remediation plan provides the following:

1. A description of the initial assessment of site contamination.
2. A proposal for assessing the degree and extent of contamination.
3. A schedule for defining and addressing the contamination.

This remediation plan is subject to modification. Although specific investigation and remediation methods are proposed, additional discoveries may require significant modification to proposed methods and schedules provided herein.



2.0 INITIAL ASSESSMENT OF SITE CONTAMINATION

2.1 Site Description

The CSX Radnor Yard facility is a line haul freight business which operates 24 hours per day, seven days per week. Radnor Yard occupies several hundred acres in south Nashville, Davidson County. The Yard is bordered by Harding Place to the south, Trousdale to the east, Veritas and its extension to the north, and Sidco Drive defines the western border. To support its line haul freight business, CSX maintains a roundhouse for "light" locomotive maintenance, repair, and a nearby locomotive fueling facility. Currently, diesel fuel is "trucked in" and dispensed into a 500,000 gallon above ground storage tank. The diesel fuel storage tank is situated at the eastern portion of Radnor Yard and is depicted by Figure 1.

2.2 Scope of Initial Assessment

During August and September of 1994, RCI conducted an investigation to characterize soils within an area of proposed excavation and construction at the CSXT Radnor Yard Facility. This work was conducted in advance of new construction planned in 1994 at the diesel fuel receiving and storage area of the facility. The existing 500,000-gallon above-ground diesel fuel storage tank is scheduled for replacement with two 125,000-gallon above-ground tanks. Installation of the new tank system will require the excavation of the soil to bedrock in the proposed construction area, the construction of a mud slab, and the installation of a synthetic liner to isolate the fill material beneath the new tank system.

Because of space limitations on site, soil excavated during construction of the two new above-ground tanks will require immediate transport off-site for disposal, pending state approval. The purpose of this investigation was to sufficiently characterize the condition of soil from ground surface to bedrock to allow for direct hauling of soils to an appropriate disposal facility immediately following excavation.



The area investigated is located in the diesel fuel receiving and storage area immediately north of the existing 500,000-gallon diesel fuel storage tank and south of the Environmental Operations/Pollution Control Plant building (Figure 1). The subject area is approximately forty-two feet in width by ninety feet in length. The area includes and is roughly bisected lengthwise by part of the secondary containment berm which surrounds the existing 500,000 diesel fuel tank. The berm divides the subject area roughly into upper (southern) and lower (northern) halves.

2.3 Field Investigation

On August 30 and 31, 1994, six soil borings were advanced within the subject area at locations where topography and other obstructions, e.g. above-ground piping, permitted. Borings AST-1 through AST-6 were advanced by the hollow-stem auger method to auger refusal at what is assumed to be bedrock. Soil samples were collected continuously from a depth of approximately one foot below ground surface (BGS) to auger refusal. Soil was classified in the field according to the Unified Soil Classification System. Soil borings were logged by a Resource Consultants field geologist. Boring locations are shown in Figure 1. A subsurface profile from ground surface down to the top of bedrock was constructed (Figure 2). Boring logs are included in Appendix A.

Auger refusal was encountered at depths ranging from seven feet BGS to eleven feet BGS. The assumed bedrock surface (Figure 1) slopes generally westward-southwestward with a shallow trough emanating in the central portion of the eastern third of the subject area and trending to the southwest. In general, shot rock was encountered from ground surface to a depth of one foot BGS; the shot rock was underlain by a silty clay/clayey silt layer which extended to depths ranging from one to four feet above bedrock, six to seven feet BGS; all borings encountered a fine-grained sand/silty sand layer from the bottom of the silt-clay layer to the bedrock surface. The sandy layer overlying the bedrock surface was characterized by distinct petroleum stain and odor at all locations except AST-1.



A water-filled void was encountered in boring AST-6 from a depth of nine to eleven feet below ground surface. A temporary well was constructed in boring AST-6. Five feet of slotted PVC .01 inch screen was installed at a depth of eleven feet BGS. A sand filter pack was installed to the top of the screen, and a bentonite seal was installed to one foot below ground surface. The water level in the temporary well was measured at 8.05' BGS on September 21, 1994. No free product was indicated in the temporary well at that time.

2.4 Analytical Parameters

Based on historical usage of the diesel fuel receiving and storage area, the target contaminant in soils in the area of investigation consists of petroleum hydrocarbons, principally in the diesel range. All soil samples were analyzed for total petroleum hydrocarbons (TPH), diesel range organics (DRO).

In order to provide additional information for full characterization of soils and provide the necessary assurances required by candidate disposal firms, additional analytical parameters were selected for analysis. One sample was selected based on visual and olfactory indications of petroleum hydrocarbon contamination for analysis of RCRA metals and one sample, also indicating high levels of petroleum hydrocarbon contamination, was analyzed for the full range of Toxicity Characteristic Leaching Procedure (TCLP) (CFR 261.4) constituents. The TCLP (CFR 261.4) List requires extract analyses of a broad range of chemical compounds, including pesticides, herbicides, volatile and semi-volatile organic parameters. The results of the TCLP extraction (pass/fail according to regulatory limits) determine whether or not the soil will be classified as a hazardous waste according to the State of Tennessee Hazardous Waste Rules. A portion of the sample analyzed for CFR 261.4 constituents was also analyzed for total PCB's.

State of Tennessee guidelines applicable to petroleum hydrocarbon contamination in soils depends on the type of hydrocarbon (diesel, gasoline, waste oil, etc.) the source of the



petroleum hydrocarbon (above ground tank, underground tank, etc.) and the planned fate of the soil (excavation and removal or soil to remain in situ). The Tennessee Division of Water Pollution Control under the existing NPDES permit for the facility has regulatory authority of what levels of petroleum hydrocarbon contamination in soils will require treatment either in-situ or by removal. These levels vary as a function of soil permeability and other factors.

The Tennessee Division of Solid Waste Management is the agency responsible for approving plans for off-site disposal of petroleum contaminated soil. Current guidelines established by this agency specify that petroleum hydrocarbon concentrations exceeding 100 mg/kg in soils require disposal as a special waste at an authorized landfill, or treatment by some other approved means, if the soil is to be removed from the site of origin. Additionally, TPH contaminated soils which exceed a TPH extract concentration of 10 mg/l following TCLP extraction can not be disposed of as a special waste at a sanitary landfill and, instead, must be disposed of at a hazardous waste landfill or be treated in a manner which reduces the petroleum hydrocarbon concentration level.

In order to determine the appropriate disposal method, following initial analyses, eight samples which registered DRO concentrations greater than 100 mg/kg were subsequently analyzed for DRO concentrations following the Toxicity Characteristic Leaching Procedure (TCLP). Results of analysis are shown in Table 1. Laboratory analytical data sheets are included in Appendix B.



TABLE 1
Results of Analysis
Soil Investigation
Diesel Fuel Receiving and Storage Area
CSX - Radnor Yard

BORING #	AST-1	AST-1	AST-1	AST-2	AST-2	AST-2	AST-2	AST-2
DEPTH	1-3	3-5	5-9	1-3	3-5	5-7	7-9	9-12
DRO (wwb) (mg/kg)	13	11	9	<4	<4	<4	<4	21000
TS	78	86.7	84.1	77.9	78.9	85.4	75.8	70.8
DRO (dwb) (mg/kg)	17	13	11	<5	<5	<5	<5	29661
TCLP-DRO (mg/l)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.8
BORING #	AST-3	AST-3	AST-3	AST-4	AST-4	AST-5	AST-5	AST-5
DEPTH	1-3	3-5	5-7	1-3	3-7	1-3	3-5	5-7
DRO (wwb) (mg/kg)	47	14	940	48	189	17	4	1870
TS	79.1	78.8	76.9	82.9	79.4	78.5	70	79.1
DRO (dwb) (mg/kg)	59	18	1222	58	238	22	<6	2364
TCLP-DRO (mg/l)	N/A	N/A	1.4	N/A	.4	N/A	N/A	1.4
BORING #	AST-5	AST-6	AST-6	AST-6				
DEPTH	7-9	3-5	5-7	7-9				
DRO (wwb) (mg/kg)	5060	1090	850	8100				
TS	77.5	76.5	76	65.2				
DRO (dwb) (mg/kg)	6529	1425	1118	12423				
TCLP-DRO (mg/l)	1.9	1.1	1.9	2.0				

2.5 Results of Analyses

Field indications of petroleum contamination at some locations/depths were confirmed by the analytical results of soil sampling. Other chemical parameters for which analyses were completed were not detected in soils at levels of regulatory concern. Results of laboratory analysis indicate that DRO assay concentrations ranged from less than 5 mg/kg to 29,661 mg/kg. As graphically illustrated in Figure 2 of this report, DRO concentrations above 100 mg/kg are limited to the lower silty and sandy material, between the overlying silt-clay layer and the assumed bedrock surface.

Because all soil samples tested registered TCLP extraction concentrations of DRO below 10 mg/l, the current regulatory limit for disposal as a Special Waste, none of the soil planned for removal should require additional treatment measures prior to disposal. That portion of the soil which registered DRO concentrations greater than 100 mg/kg should be classified as a Special Waste, qualifying for disposal at a permitted sanitary landfill.

2.6 QA/QC Procedures

Drilling and sampling equipment (augers, split spoons, rods) were decontaminated between boring locations using Liquinox/water solution followed by a potable water rinse and a deionized water rinse. Decontamination water was subsequently disposed of through the CSX oil/water treatment system and, thence, to Metro sewers. The Resource Consultants field geologist collecting the soil samples wore a new pair of latex gloves to collect each sample. Samples were collected in laboratory-supplied 16 ounce glass jars with teflon lined lids and stored at four degrees Celsius. Proper chain-of-custody procedures were followed at all times.

2.7 Groundwater Contamination

As previously indicated in this report, the presence of groundwater was noted near the assumed soil/bedrock interface at Sampling Location AST-6, which was converted into

a temporary monitoring well. Subsequent measurements of water levels at AST-6 have not detected free product.

On October 6, 1994, (following notification of the Division of Water Pollution Control of soil contamination) routine water level measurements were conducted of several exploratory well pairs at the Radnor Yard facility. These exploratory well pairs have been recently installed in conjunction with a dye trace study currently being conducted at several facilities in the area and are not related to the assessment completed in the diesel fuel storage and receiving area. Two of these exploratory well pairs, designated E-3S, E-3D and E-4S, E-4D, are in the general vicinity of the diesel fuel storage and receiving area and are shown of Figure 1. During the October 6 measurement, approximately 0.43 feet of free product was measured in the E-3S exploratory well. An additional measurement of AST-6 was made on this date which, again, did not detect the presence of free product.

Similar to AST-6, E-3S is also cased and screened in unconsolidated material and extends to the assumed soil/bedrock interface. Although, E-3S is at a higher elevation topographically than AST-6, it is located on an artificially elevated railroad embankment constructed from fill material. As of October 6, free product had not been detected in E-3D, which is constructed in bedrock, or any of the other CSX exploratory wells constructed in conjunction with the dye trace study.

2.8 Summary of Initial Assessment

A recent assessment of soils in the immediate vicinity of the existing 500,000 gallon, above ground, diesel fuel storage tank at the CSX Radnor Yard facility indicates the presence of diesel range, petroleum hydrocarbon contamination. In the area of investigation, contamination is limited to soils near the assumed soil/bedrock interface. Most of the soils from the surface to the assumed soil/bedrock interface are not contaminated (as contamination is defined by TPH values exceeding 100 mg/kg). Soils that are contaminated

do not exceed the upper limits for special waste disposal (as defined by TPH values up to 10 mg/l, following TCLP extraction). Analyses of soil for metals, PCB's, pesticides, herbicides, volatiles and semivolatiles indicates that contamination in the area of the diesel fuel storage tank appears to be limited to petroleum hydrocarbon contamination.

The recent (October 6, 1994) detection of free product in an exploratory well located in the area of the diesel fuel storage tank, indicates the likely contamination of groundwater in the area around Well E-3S.

Based on results of laboratory analysis, soil within the proposed construction area has been delineated into two separate zones, each requiring a different method of disposal. The upper zone extends from the ground surface down to a depth of approximately four feet below the bottom of the containment berm, and consists of the soil which registered DRO concentrations less than 100 mg/kg as indicated by field activities and laboratory analysis, approximately 960 cubic yards in place. The lower zone consists of all remaining soil down to the assumed bedrock interface which registered TPH-DRO total concentrations above 100 mg/kg but did not exceed 10 mg/l following TCLP extraction, approximately 500 to 600 cubic yards.

Because the soil will be hauled off site for disposal at the time of excavation, proper identification of each zone will be required in the field. The shot rock covering the subject area and the soil in the upper zone must be completely removed prior to the excavation of the lower zone.

During the first phase of excavation, shot rock from the entire area will be removed and that portion of the containment berm which lies within the subject area (elevations 579' to 585' MSL) will be removed and hauled from the site. The second phase of the excavation will require the removal of a four-foot layer of soil from the entire subject area. This phase

of the operation will extend the excavation to an approximate elevation of 575' MSL. The actual depth of excavation during the second phase will be determined in the field based on indications of petroleum contamination and the sand content of the soil. For this reason, the excavation should proceed in increments to allow the inspection of the soil layer and a determination of the interface between the bottom of the silt-clay layer and the top of the sandy layer.

The layer of sand/silty sand overlying the bedrock surface will be excavated during the third and final phase of the operation. It will be necessary to excavate the predominately wet and predominantly dry soil intermittently to allow mixing of the soil to occur. Mixing of predominantly dry soil with predominantly wet soil in the lower zone will be required in order that the overall mixture will be considered dry for landfill disposal purposes. The mixture will be required to pass the paint-filter test administered by solid waste disposal facilities. The method utilized in the field to fulfill this requirement will be the contractor's responsibility. The EPA approved method for conducting a paint filter test, as specified by "Test Methods for Evaluating Solid Waste" (SW-846, Method Number 9095), is provided in Appendix C. Groundwater encountered during excavation operations will be pumped into a settling tank and then to the oil/water treatment lagoon.

3.0 PLANNED ASSESSMENT OF THE DEGREE AND EXTENT OF CONTAMINATION

3.1 Definition of the Extent of Soil Contamination

During November of 1994, planned excavation of soils in the area of new tank construction is scheduled to begin. During this excavation period, further observations and characterization of these soils will facilitate selection of additional sampling strategies to be applied to soils in the vicinity of the diesel fuel storage tank. Following initial soil excavation, additional soil borings and/or soil excavation will be applied in order to determine the character and extent of contamination in soils in the vicinity of the diesel fuel storage tank.

3.2 Definition of the Extent of Groundwater Contamination

Concurrent with the planned soil excavation initiated during November, 1994, dewatering of portions of the excavation, particularly the lower one third, is anticipated to be necessary, based on information derived from the initial assessment. Dewatering of this material will provide an opportunity to define several near surface groundwater flow parameters. This will be an important first stage necessary for the design and installation of a groundwater treatment system in unconsolidated materials at the site. Observations are expected to include water level variances in exploratory wells near the excavation, a preliminary determination of water quantity and flow rates per unit area in unconsolidated material, the character and vertical extent of groundwater flow near the soil/bedrock interface and better definition of the extent and nature of suspected confining zones in the near surface material.

Following initial observations based on dewatering of the excavation, the location and number of additional groundwater monitoring wells in the area can be evaluated. Existing exploratory wells proximate to the area of investigation will be evaluated for potential use in defining the vertical and lateral extent of contamination. To the extent possible, available information generated from the area dye trace study being conducted by others will be utilized in assessing groundwater flow directions.

4.0 IMPLEMENTATION SCHEDULE FOR ASSESSMENT AND REMEDIATION

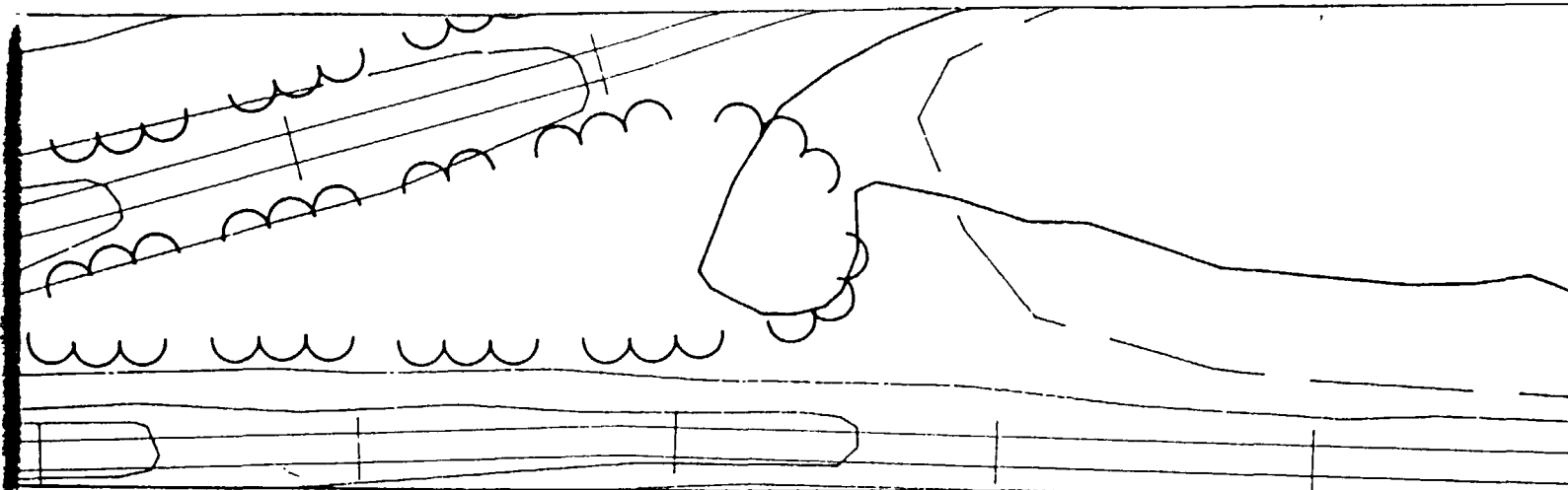
4.1 Initial Assessment Schedule

Initial assessment activities are planned for November, 1994, concurrent with planned excavation, as described in the previous sections. Completion of the two new 125,000 gallon diesel tanks and containment system, as well as closure and removal of the existing 500,000 gallon diesel tank is scheduled for completion by June, 1995. Following initial excavation for the new tank system, scheduled to be completed by December, 1994, additional investigation based on information derived from excavation activities can be initiated. An estimated timeline showing the currently planned additional assessment activities is included as Figure 3.

4.2 Initial Remediation Schedule

Planned excavation in the area of new tank installation during November, 1994 will remove up to 2,000 cubic yards of soil, with an estimated 500 to 600 cubic yards of this material designated as contaminated. Disposal of contaminated soil as a special waste by (pending) permit is currently planned. During this period, an undetermined amount of contaminated water will be removed during the dewatering process. This water will initially be pumped to a settling/holding tank and thence to a water treatment system. The final determination of the treatment system to be applied to this water is pending, but is currently anticipated to be a free oil treatment system at the Radnor Yard facility. Following an evaluation of information obtained during the excavation and dewatering process, a pump and treat remediation system may be applied to remove free product and/or contaminated groundwater in unconsolidated subsurface material at the site. Other remediation methods, including soil excavation and disposal, in-situ treatment, and other soil and groundwater treatment technologies will be evaluated and selected following definition of the degree and extent of contamination. A proposed schedule for additional remediation of the area of concern is included on Figure 3.

2 4 0845



ICE
TANTS

CSX

CSX TRANSPORTATION
RADNOR YARD NASHVILLE, TN

BASE MAP SHOWING
BOREHOLE LOCATIONS

DATE

APPROVED

DATE

PROJECT NO.

8-4386.00

SCALE

1" = 30'

SHEET NO.

FIGURE 1

565

FORCE
PLANTS

CSX

CSX TRANSPORTATION
RADNOR YARD NASHVILLE, TN

BORING PROFILE A - A'
PLAN AND PROFILE

DATE

APPROVED

DATE

PROJECT NO.

8-4386.00

SCALE

1" = 10'

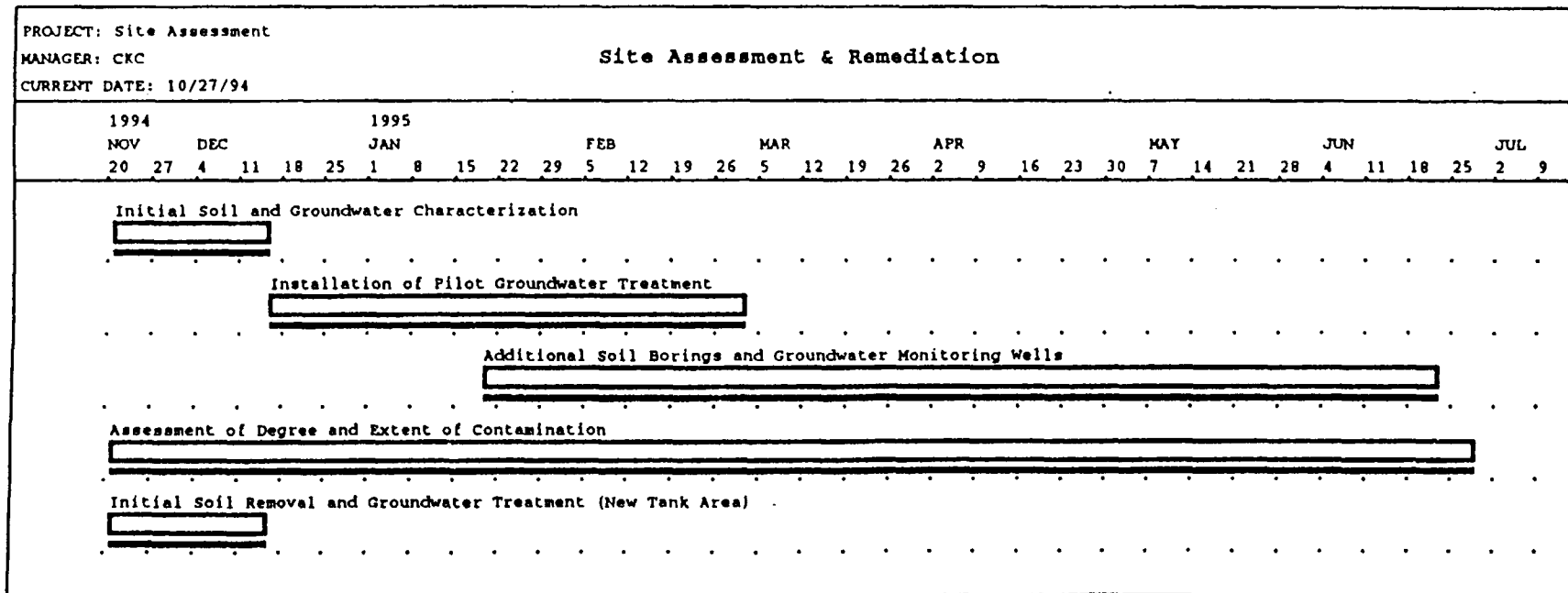
SHEET NO.

FIGURE 2

24 0845

Figure 3

TIMELINE



APPENDIX A

Boring Logs

Logged by: MJF

Surface Elevation: 584.78

Date Drilled: August 31, 1994

Casing Elevation: N/A

Boring Type: Hollow Stem Auger

Remarks:

Sampling Method: Split Spoon

LITHOLOGY

SAMPLE DATA

FIELD

LAB

Depth (feet)	Graphic Log	Description	Recovered	Pushed	Penetrometer	DRO (mg/kg)
		Shot rock.				
		Silty loam, soft, dry, dusky red (2.5YR3/4), no odor.			.5	17
					<.25	13
5		CLAYEY SILT (ML), soft, damp, dark reddish-brown (5YR3/2); no odor.			<.25	
		SAND/SILTY SAND (SP-SM), very fine-grained, wet, dark yellowish-brown (10YR4/4); with clay-silt, 15-40% - 7-7.5', diesel odor and stain.			--	11
		AUGER REFUSAL AT 9 FEET.				

CSX Transportation
Radnor Yard
Nashville, Tennessee

Log of Boring AST-1



Logged by: MJF

Surface Elevation: 583.18

Date Drilled: August 31, 1994

Casing Elevation: N/A

Boring Type: Hollow Stem Auger

Remarks:

Sampling Method: Split Spoon

LITHOLOGY

SAMPLE DATA FIELD LAB

Depth (feet)	Graphic Log	Description	Recovered	Pushed	Penetrometer	DRO (mg/kg)
		Shot Rock.				
					.5	<5.0
		CLAYEY-SILT (ML), very moist, soft, dark gray (7.5YR4/1), no odor.			.25	<5.0
		Very moist to 4'.				
5		Dry, Stiff.	5		4.0	<5.0
		Very moist with diesel odor and stain.				
					1.75	<5.0
		Wet, diesel odor and stain with sand, very fine-grained, poorly graded.				
10		SILTY SAND (SM-SP), loose, wet, very fine-grained, poorly graded, with diesel odor and stain.	10		.5	
						29661
		AUGER REFUSAL AT 12 FEET.				

RCI Project No. 9-4366.02

Tennessee, Radnor Yard



CSX Transportation
Radnor Yard
Nashville, Tennessee

Log of Boring AST-2

Sheet 1 of 1

RCI Project No. 9-4366.02

24 0852

Logged by: MJF

Surface Elevation: 579.52

Date Drilled: September 1, 1994

Casing Elevation: N/A

Boring Type: Hollow Stem Auger

Remarks:

Sampling Method: Split Spoon

LITHOLOGY

SAMPLE DATA FIELD LAB

Depth (feet)	Graphic Log	Description	Recovered	Pushed	Penetrometer	DPO (mg/kg)
		Shot rock.				
		CLAYEY-SILT (ML), very stiff, dry brown (7.5YR4/4), no odor or stain.			4.0	58
					3.0	
5		With sand; slight diesel odor.	5		--	238
		SILTY SAND (SM-SC), very fine-grained, poorly graded, loose, moist to wet with diesel odor and stain.				
		AUGER REFUSAL AT 7 FEET.				

Printed ID: RAD Log ID: AST-4

Resource Consultants, Inc.



CSX Transportation
Radnor Yard
Nashville, Tennessee

Log of Boring AST-4

Sheet 1 of 1

RCI Project No. E-4385.00

Logged by: MJF
 Date Drilled: August 1, 1994
 Boring Type: Hollow Stem Auger
 Sampling Method: Split Spoon

Surface Elevation: 578.85
 Casing Elevation: N/A
 Remarks: Water level 570.05 on 9/20/94.

LITHOLOGY			SAMPLE DATA		FIELD	LAB
Depth (feet)	Graphic Log	Description	Recovered	Pushed	Penetrometer	DPO (mg/kg)
.....		Shot Rock	.....	.....	.....	.....
.....		CLAYEY-SILT (ML), stiff, moist, strong brown (7.5YR5/6); no odor.	.....	.....	1.5	.....
.....	
.....		Very soft; diesel odor.	.....	.....	.25	1425
5		With sand; mottled (40%), light greenish-gray (5GY7/1).	5	.....	.....	1118
.....		CLAYEY-SILTY SAND (SM-SC), soft, wet, olive brown (2.5Y4/3); diesel odor and stain.	.....	.....	.....	12423
.....		Wet, gray-black, petroleum saturated, no recovery, SPT dropped to 11'.	.....	.....	.....	.....
10		Void.	10	.....	.....	.....
.....		AUGER REFUSAL AT 11 FEET.	.....	.....	.....	.....

Project ID: RAD_LogID: AST-6

Drawing: RADRAD_001



CSX Transportation
Radnor Yard
Nashville, Tennessee

Log of Boring AST-6

Logged by: MJF

Surface Elevation: 607.21

Date Drilled: August 18, 1994

Casing Elevation: 606.89

Boring Type: Air Rotary

Remarks:

Sampling Method: Split Spoon

WELL CONSTRUCTION			LITHOLOGY	SAMPLE DATA			FIELD	LAB
Depth (feet)	CHRISTY BOX	LOCKING CAP	Graphic Log	Description	Recovered	Pushed	Penetrometer	
				Fill material/black cinder.				
5				No Recovery.				
				Boulder.				
10				CLAYEY-SILT (CL-ML), soft to medium stiff, moist, strong brown (7.5YR4/6), no odor.			.5	
15				Moist with darker brown mottlings (5YR3/1), 15%, no odor.			.5	
20								
25				Stiff.			1.5	
30				Wood/crossties.				
35				CLAYEY-SILT (CL-ML), stiff, dry, dusky red (2.5YR4/2).			1.5	
				Moist to wet with slight hydrocarbon (diesel) odor.			.5	

Cont'd.....



CSX Transportation
Radnor Yard
Nashville, Tennessee

Log of Well E-3S

Logged by: MJF

Surface Elevation: 607.21

Date Drilled: August 18, 1994

Casing Elevation: 606.89

Boring Type: Air Rotary

Remarks:

Sampling Method: Split Spoon

WELL CONSTRUCTION		LITHOLOGY	SAMPLE DATA			FIELD	LAB
Depth (feet)	Graphic Log	Description	Recovered	Pushed	Penetrometer		
40		Damp with pebbles (5%), diesel odor and stain.					
45							
50		Strong diesel-type odor.					
		Bedrock.					
		TOTAL DEPTH: 54 FEET.					
		(1) Water level 12 hours after completion.					

Bottom of Screen
at 54 feet.Bedrock.
TOTAL DEPTH: 54 FEET.

(1) Water level 12 hours after completion.

1027241 Project ID: RAD Log ID: MAY-95

TERRACON CONSULTANTS



CSX Transportation
Radnor Yard
Nashville, Tennessee

Log of Well E-3S

APPENDIX B

Analytical Reports



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Mr. William Cummings
CSX Transportation Company, Radnor Yards
500 Water Street
Jacksonville, FL 32232-5057

September 14, 1994
Project No. 08-4386.00

ANALYTICAL REPORT

Sample Description:

Sample No. 197,495 - Soil Grab AST-1, 1-3'
Sample No. 197,496 - Soil Grab AST-1, 3-5'
Sample No. 197,497 - Soil Grab AST-1, 5-7'

Client Sample I.D.	AST-1, 1-3'	AST-1, 3-5'	AST-1, 5-7'
Sample Number	197,495	197,496	197,497
Date Collected	8/31/94	8/31/94	8/31/94
Time Collected	NR	NR	NR
Date Received	9/02/94	9/02/94	9/02/94
Useful Range Organics (mg/kg)	13 ww b	11 ww b	9 ww b
Total Solids (%)	78.0	86.7	84.1

NR: Not reported.

Mary Louise Harris

wwb: wet weight basis (or as received).

RCI Laboratory Certification Numbers: AL-40400, AR, CA-1897, CT-PH-0572, FL-E87363, KS-E-204-E-1177, KY-90011, NY-10817, NC-274, PA-68-389, TN-02007, WI-999940040

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Mr. William Cummings
CSX Transportation Company, Radnor Yards
500 Water Street
Jacksonville, FL 32232-5057

September 14, 1994
Project No. 08-4386.00

ANALYTICAL REPORT

Sample Description:

Sample No. 197,498 - Soil Grab AST-2, 1-3'
Sample No. 197,499 - Soil Grab AST-2, 3-5'
Sample No. 197,500 - Soil Grab AST-2, 5-7'

Client Sample I.D.	AST-2, 1-3'	AST-2, 3-5'	AST-2, 5-7'
Sample Number	197,498	197,499	197,500
Date Collected	8/31/94	8/31/94	8/31/94
Time Collected	NR	NR	NR
Date Received	9/02/94	9/02/94	9/02/94
Low Level Range Organics (mg/kg)	<4.0 ww	<4.0 ww	<4.0 ww
Total Solids (%)	77.9	78.9	85.4

NR: Not reported.

Mary Louise Hain

wwb: wet weight basis (or as received).

☐ Laboratory Certification Numbers: AL-40400, AR, CA-1897, CT-PH-0572, FL-E87363, KS-E-204/E-1177, KY-90011, NY-10817, NC-274, PA-68-389, TN-02007, WI 99004/0040

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September 14, 1994
Project No. 08-4386.00

ANALYTICAL REPORT

Sample Description:

Sample No. 197,501 - Soil Grab AST-2, 7-9'
Sample No. 197,502 - Soil Composite AST-2, 9-11' & 11-13'
Sample No. 197,503 - Soil Grab AST-3, 1-3'

Client Sample I.D.	AST-2, 7-9'	AST-2, 9-11, 11	AST-3, 1-3'
Sample Number	197,501	197,502	197,503
Date Collected	8/31/94	8/31/94	8/31/94
Time Collected	NR	NR	NR
Date Received	9/02/94	9/02/94	9/02/94
Del Range Organics (mg/kg)	<4.0 ww	21,000 ww	47 ww
Total Solids (%)	75.8	70.8	79.1

NR: Not reported.

Mary Louise Harris

wwb: wet weight basis (or as received).

☐ Laboratory Certification Numbers: AL-40400, AR, CA-1897, CT-PH-0572, FL-E87363, KS-F-704/E-1177, KY-90011, NY-10817, NC-274, PA-68-389, TN-02007, WI-999940040

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ANALYTICAL REPORT

Sample Description:

 Sample No. 197,504 - Soil Grab AST-3, 3-5'
 Sample No. 197,505 - Soil Grab AST-3, 5-7'
 Sample No. 197,506 - Soil Grab AST-4, 1-3'

Client Sample I.D.	AST-3, 3-5'	AST-3, 5-7'	AST-4, 1-3'
Sample Number	197,504	197,505	197,506
Date Collected	8/31/94	8/31/94	9/01/94
Time Collected	NR	NR	NR
Date Received	9/02/94	9/02/94	9/02/94
Arsenic (mg/kg)		5.4 wwb	
Barium (mg/kg)		200 wwb	
Cadmium (mg/kg)		1.0 wwb	
Chromium (mg/kg)		23 wwb	
Lead (mg/kg)		31 wwb	
Mercury (mg/kg)		<0.1 wwb	
Selenium (mg/kg)		<1 wwb	
Silver (mg/kg)		<0.5 wwb	
Diesel Range Organics (mg/kg)	14 wwb	940 wwb	48 wwb
Total Solids (%)	78.8	76.9	82.9

NR: Not reported.

wwb: wet weight basis (or as received).


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ANALYTICAL REPORT

Sample Description:

Sample No. 197,616 - Soil Grab AST-4, 3-5' & 5-7' (relog of 197514)

Client Sample I.D.	AST-4, 3-5, 5-7
Sample Number	197,616
Date Collected	9/01/94
Time Collected	NR
Date Received	9/02/94

Diesel Range Organics (mg/kg)	189 ww
Polychlorinated Biphenyls (mg/kg)	<0.02 ww
Total Solids (%)	79.4

NR: Not reported.

Mary Louise

ww: wet weight basis (or as received).

RCI Laboratory Certification Numbers: AL-40400, AR, CA-1897, CT-PH-0572, FL-E87363, KS-E-204, E-1177, KY-90011, NY-10817, NC-274, PA-6R-389, TN-02007, WI-909940040

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September 14, 1994
Project No. 08-4386.00

ANALYTICAL REPORT

Sample Description:

Sample No. 197,507 - Soil Grab AST-5, 1-3'
Sample No. 197,508 - Soil Grab AST-5, 3-5'
Sample No. 197,509 - Soil Grab AST-5, 5-7'

Client Sample I.D.	AST-5, 1-3'	AST-5, 3-5'	AST-5, 5-7'
Sample Number	197,507	197,508	197,509
Date Collected	9/01/94	9/01/94	9/01/94
Time Collected	NR	NR	NR
Date Received	9/02/94	9/02/94	9/02/94
Low Level Range Organics (mg/kg)	17 ww	<4.0 ww	1870 ww
Total Solids (%)	78.5	70.0	79.1

NR: Not reported.

Mary Louise Linn

wwb: wet weight basis (or as received).

RCI Laboratory Certification Numbers: AL-40400, AR, CA-1897, CT-PH-0572, FL-E87363, KS-E-204-E-1177, KY-90011, NY-10817, NC-274, PA-68-389, TN-02007, WI-999940040

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September 14, 1994
Project No. 08-4386.00

Mr. William Cummings
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ANALYTICAL REPORT

Sample Description:

Sample No. 197,510 - Soil Grab AST-5, 7-9'
Sample No. 197,511 - Soil Grab AST-6, 3-5'
Sample No. 197,512 - Soil Grab AST-6, 5-7'

Client Sample I.D.	AST-5, 7-9'	AST-6, 3-5'	AST-6, 5-7'
Sample Number	197,510	197,511	197,512
Date Collected	9/01/94	9/01/94	9/01/94
Time Collected	NR	NR	NR
Date Received	9/02/94	9/02/94	9/02/94
Diesel Range Organics (mg/kg)	5060 ww	1090 ww	850 ww
Total Solids (%)	77.5	76.5	76.0

NR: Not reported.

Mary Louise Harris

wwb: wet weight basis (or as received).

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September 14, 1994
Project No. 08-4386.00

ANALYTICAL REPORT

Sample Description:

Sample No. 197,513 - Soil Grab AST-6, 7-9'

Client Sample I.D.	AST-6, 7-9'
Sample Number	197,513
Date Collected	9/01/94
Time Collected	NR
Date Received	9/02/94

Diesel Range Organics (mg/kg)	8100 ww b
Total Solids (%)	65.2

NA. Not reported.

Mary Louise

wwb: wet weight basis (or as received).

Laboratory Certification Numbers: AL-40400, AR-1897, CT-PH-0572, FL-E87363, KS-E-204-E-1177, KY-90011, NY-10817, NC-274, PA-68-389, TN-02007, WI-999940040

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September 14, 1994
Project No. 08-4386.00

ANALYTICAL REPORT

Sample Description: Radnor Yards-Soil Grab AST-4, 3-4' & 5-7'		Regulatory Standards	Hazardous Waste Number	Typical Detection Limit	SW-846 (3rd Edition) Method No.
Date Collected	9/1/94				
Time Collected	Not Reported				
Date Received	9/2/94				
RCL Sample Number	197514				
Toxicity Characteristic Leaching Procedure Extract Number	197515				
Zero Headspace Extract Number	197516				
pH (pH units)	6.9	2; 12.5	D002	NA	9045A
TCLP Extraction					
TCLP Metals					
Arsenic	<0.002	5.0	D004	0.002	3020A 7060
Barium	2.6	100.0	D005	0.1	3010A 7080
Cadmium	<0.005	1.0	D006	0.005	3010A 7130
Chromium	<0.02	5.0	D007	0.02	3010A 7190
Lead	<0.1	5.0	D008	0.1	3010A 7420
Mercury	<0.002	0.2	D009	0.002	7470
Selenium	<0.01	1.0	D010	0.01	7740
Silver	<0.01	5.0	D011	0.01	3010 7760A
TCLP Extractable Organics					
o-cresol	<0.10	200.0	D023	0.10	3510A 8270A
m-cresol	<0.10	200.0	D024	0.10	3510A 8270A
p-cresol	<0.10	200.0	D025	0.10	3510A 8270A
1,4-dichlorobenzene	<0.10	7.5	D027	0.10	3510A 8270A
2,4-dinitrotoluene	<0.10	0.13	D030	0.10	3510A 8270A
Hexachlorobenzene	<0.10	0.13	D032	0.10	3510A 8270A
Hexachlorobutadiene	<0.10	0.5	D033	0.10	3510A 8270A
Hexachloroethane	<0.10	3.0	D034	0.10	3510A 8270A
Nitrobenzene	<0.10	2.0	D036	0.10	3510A 8270A
Pentachlorophenol	<0.10	100.0	D037	0.10	3510A 8270A
Pyridine	<0.10	5.0	D038	0.10	3510A 8270A
2,4,5-trichlorophenol	<0.10	400.0	D041	0.10	3510A 8270A
2,4,6-trichlorophenol	<0.10	2.0	D042	0.10	3510A 8270A
TCLP Pesticides/Herbicides					
Chlordane	<0.005	0.03	D020	0.002	3510A 8080
2,4-D	<5.0	10.0	D016	5	3510A 8270A
Endrin	<0.005	0.02	D012	0.002	3510A 8080
Heptachlor (and its epoxide)	<0.005	0.008	D031	0.002	3510A 8080
Lindane	<0.005	0.4	D013	0.002	3510A 8080
Methoxychlor	<0.005	10.0	D014	0.002	3510A 8080
Toxaphene	<0.005	0.5	D015	0.002	3510A 8080
2,4,5-TP (Silvex)	<0.5	1.00	D017	0.5	3510A 8270A
ZHS Extraction					
TCLP Volatile Organics					
Benzene	<0.10	0.5	D018	0.10	5030A 8260
Carbon tetrachloride	<0.10	0.5	D019	0.10	5030A 8260
Chlorobenzene	<0.10	100.0	D021	0.10	5030A 8260
Chloroform	<0.10	6.0	D022	0.10	5030A 8260
1,2-dichloroethane	<0.10	0.5	D028	0.10	5030A 8260
1,1-dichloroethylene	<0.10	0.7	D029	0.10	5030A 8260
Methyl ethyl ketone	<0.10	200.0	D035	0.10	5030A 8260
Tetrachloroethylene	<0.10	0.7	D039	0.10	5030A 8260
Trichloroethylene	<0.10	0.5	D040	0.10	5030A 8260
Vinyl chloride	<0.10	0.2	D043	0.10	5030A 8260

All units are mg/l unless otherwise noted.

TCLP: SW-846 Method 1311.

Mary Louise Linn
Mary Louise Linn, Principal/Laboratory Services

2 4 0867



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September 21, 1994
Project No. 08-4386.00

Mr. William Cummings
CSX Transportation Company, Radnor Yards
500 Water Street
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ANALYTICAL REPORT

Sample Description:

Sample No. 198,286 - Soil Comp. AST-2, 9-11' & 11-13' (relog of 197502)
Sample No. 198,287 - TCLP Extract of 198286

Client Sample I.D.	197502	197502
Sample Number	198,286	198,287
Date Collected	8/31/94	
Time Collected	NR	
Date Received	9/14/94	9/14/94

TF	High Boil. Component	1.8
TC	Extraction Begun	9/15/94

All units are mg/l unless noted.
NR: Not reported.

Mary Louise Levin



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ANALYTICAL REPORT

Sample Description:

Sample No. 198,288 - Soil Grab AST-3, 5-7' (relog of 197505)
Sample No. 198,289 - TCLP Extract of 198288

Client Sample I.D.	197505	197505
Sample Number	198,288	198,289
Date Collected	8/31/94	
Time Collected	NR	
Date Received	9/14/94	9/14/94

PH- High Boil. Component		1.4
CL- Extraction Begun	9/15/94	

All units are mg/l unless noted.
NR: Not reported.

Mary Louise King



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September 21, 1994
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Mr. William Cummings
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ANALYTICAL REPORT

Sample Description:

Sample No. 198,300 - Soil Comp. AST-4, 3-5' & 5-7' (relog of 197616)
Sample No. 198,301 - TCLP Extract of 198300

Client Sample I.D.	197616	197616
Sample Number	198,300	198,301
Date Collected	9/01/94	
Time Collected	NR	
Date Received	9/14/94	9/14/94
PH High Boil. Component		0.4
CLP Extraction Begun	9/15/94	

All units are mg/l unless noted.
R: Not reported.

Mary Louise Kim



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ANALYTICAL REPORT

Sample Description:

Sample No. 198,290 - Soil Grab AST-5, 5-7' (relog of 197509)
Sample No. 198,291 - TCLP Extract of 198290

Client Sample I.D.	197509	197509
Sample Number	198,290	198,291
Date Collected	9/01/94	
Time Collected	NR	
Date Received	9/14/94	9/14/94

TPH- High Boil. Component		1.4
TC Extraction Begun	9/15/94	

All units are mg/l unless noted.
NR: Not reported.

Mary Louise Hein



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ANALYTICAL REPORT

Sample Description:

Sample No. 198,292 - Soil Grab AST-5, 7-9' (relog of 197510)
Sample No. 198,293 - TCLP Extract of 198292

Client Sample I.D.	197510	197510
Sample Number	198,292	198,293
Date Collected	9/01/94	
Time Collected	NR	
Date Received	9/14/94	9/14/94
PH+ High Boil. Component		1.9
TCLP Extraction Begun	9/15/94	

1 units are mg/l unless noted.
: Not reported.

Mary Louise King

2 4 0872



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ANALYTICAL REPORT

Sample Description:
Sample No. 198,294 - Soil Grab AST-6, 3-5' (relog of 197511)
Sample No. 198,295 - TCLP Extract of 198294

Client Sample I.D.	197511	197511
Sample Number	198,294	198,295
Date Collected	9/01/94	
Time Collected	NR	
Date Received	9/14/94	9/14/94

PH- High Boil. Component		1.1
PCI Extraction Begun	9/15/94	

All units are mg/l unless noted.
NR: Not reported.

Mary Louise Kim



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Project No. 08-4386.00

Mr. William Cummings
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ANALYTICAL REPORT

Sample Description:

Sample No. 198,296 - Soil Grab AST-6, 5-7' (relog of 197512)
Sample No. 198,297 - TCLP Extract of 198296

Client Sample I.D.	197512	197512
Sample Number	198,296	198,297
Date Collected	9/01/94	
Time Collected	NR	
Date Received	9/14/94	9/14/94

PH- High Boil. Component		1.9
CL ₁ Extraction Begun	9/15/94	

All units are mg/l unless noted.
NR: Not reported.

Mary Louise Kim

2 4 0874



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September 21, 1994
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Mr. William Cummings
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ANALYTICAL REPORT

Sample Description:

Sample No. 198,298 - Soil Grab AST-6, 7-9' (relog of 197513)
Sample No. 198,299 - TCLP Extract of 198298

Client Sample I.D.	197513	197513
Sample Number	198,298	198,299
Date Collected	9/01/94	
Time Collected	NR	
Date Received	9/14/94	9/14/94

PH- High Boil. Component	2.0
CL Extraction Begun	9/15/94

11 units are mg/l unless noted.
R: Not reported.

Mary Louise Kim

APPENDIX C

Paint Filter Liquids Test Methods

PAINT FILTER LIQUIDS TEST

1.0 SCOPE AND APPLICATION

1.1 This method is used to determine the presence of free liquids in a representative sample of waste.

1.2 The method is used to determine compliance with 40 CFR 264.314 and 265.314.

2.0 SUMMARY OF METHOD

2.1 A predetermined amount of material is placed in a paint filter. If any portion of the material passes through and drops from the filter within the 5-min test period, the material is deemed to contain free liquids.

3.0 INTERFERENCES

3.1 Filter media were observed to separate from the filter cone on exposure to alkaline materials. This development causes no problem if the sample is not disturbed.

4.0 APPARATUS AND MATERIALS

4.1 Conical paint filter: Mesh number 60 (fine meshed size). Available at local paint stores such as Sherwin-Williams and Glidden for an approximate cost of \$0.07 each.

4.2 Glass funnel: If the paint filter, with the waste, cannot sustain its weight on the ring stand, then a fluted glass funnel or glass funnel with a mouth large enough to allow at least 1 in. of the filter mesh to protrude should be used to support the filter. The funnel is to be fluted or have a large open mouth in order to support the paint filter yet not interfere with the movement, to the graduated cylinder, of the liquid that passes through the filter mesh.

4.3 Ring stand and ring, or tripod.

4.4 Graduated cylinder or beaker: 100-mL.

5.0 REAGENTS

5.1 None.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples must be collected according to the directions in Chapter Nine of this manual.

6.2 A 100-mL or 100-g representative sample is required for the test. If it is not possible to obtain a sample of 100 mL or 100 g that is sufficiently representative of the waste, the analyst may use larger size samples in multiples of 100 mL or 100 g, i.e., 200, 300, 400 mL or g. However, when larger samples are used, analysts shall divide the sample into 100-mL or 100-g portions and test each portion separately. If any portion contains free liquids, the entire sample is considered to have free liquids.

7.0 PROCEDURE

7.1 Assemble test apparatus as shown in Figure 1.

7.2 Place sample in the filter. A funnel may be used to provide support for the paint filter.

7.3 Allow sample to drain for 5 min into the graduated cylinder.

7.4 If any portion of the test material collects in the graduated cylinder in the 5-min period, then the material is deemed to contain free liquids for purposes of 40 CFR 264.314 and 265.314.

8.0 QUALITY CONTROL

8.1 Duplicate samples should be analyzed on a routine basis.

9.0 METHOD PERFORMANCE

9.1 No data provided.

10.0 REFERENCES

10.1 None required.

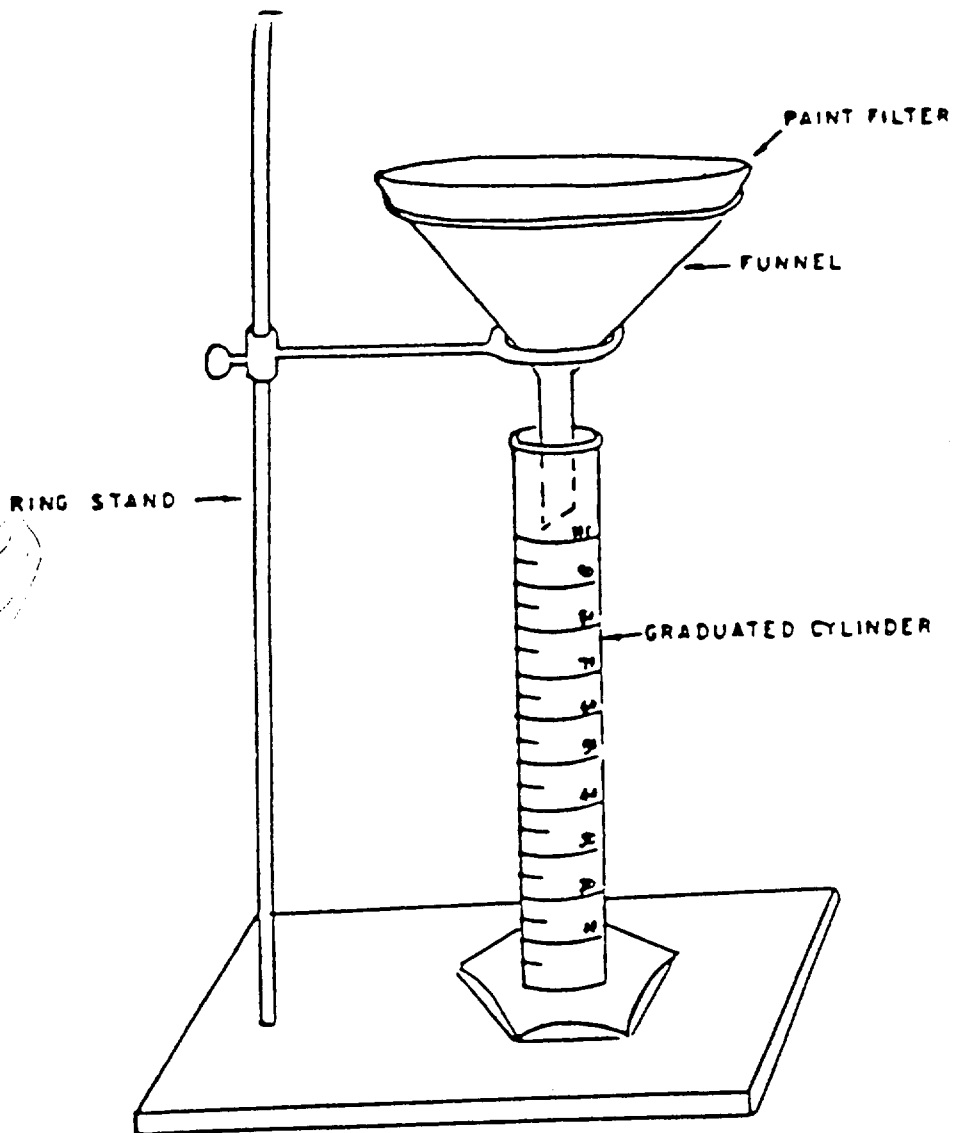
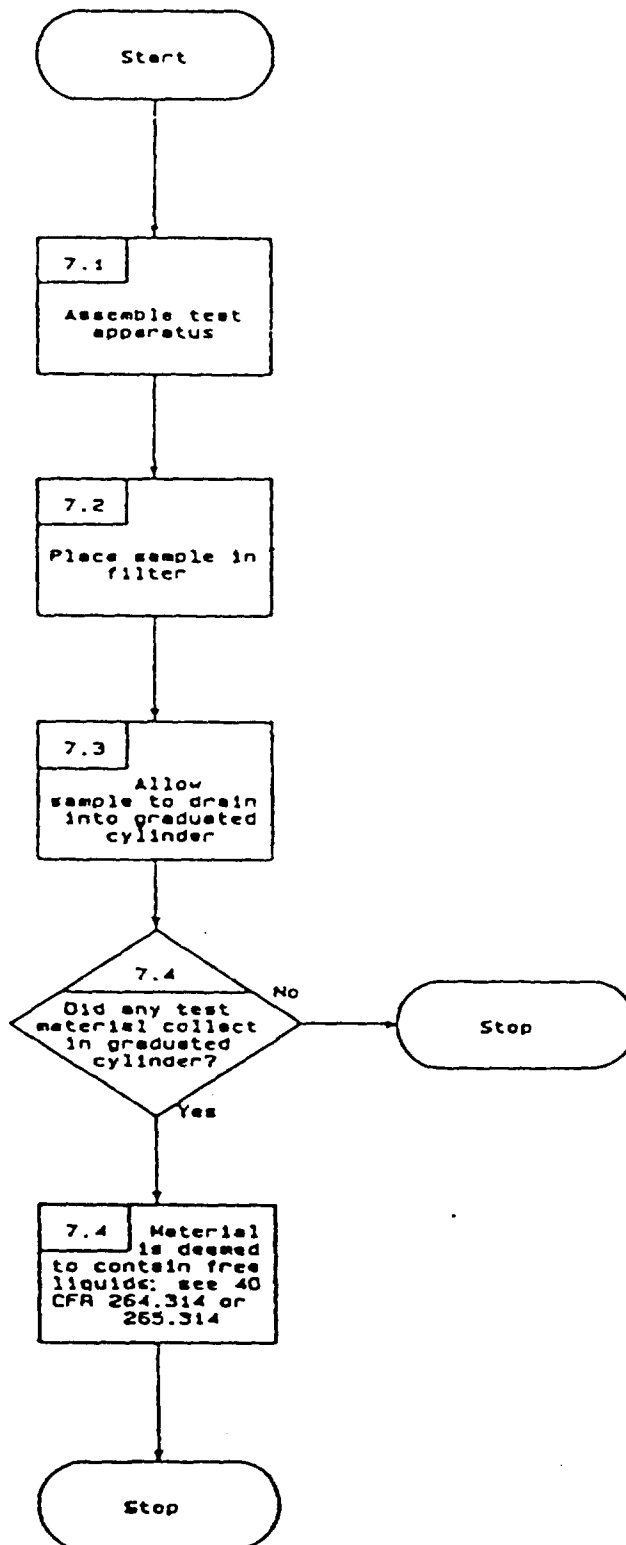
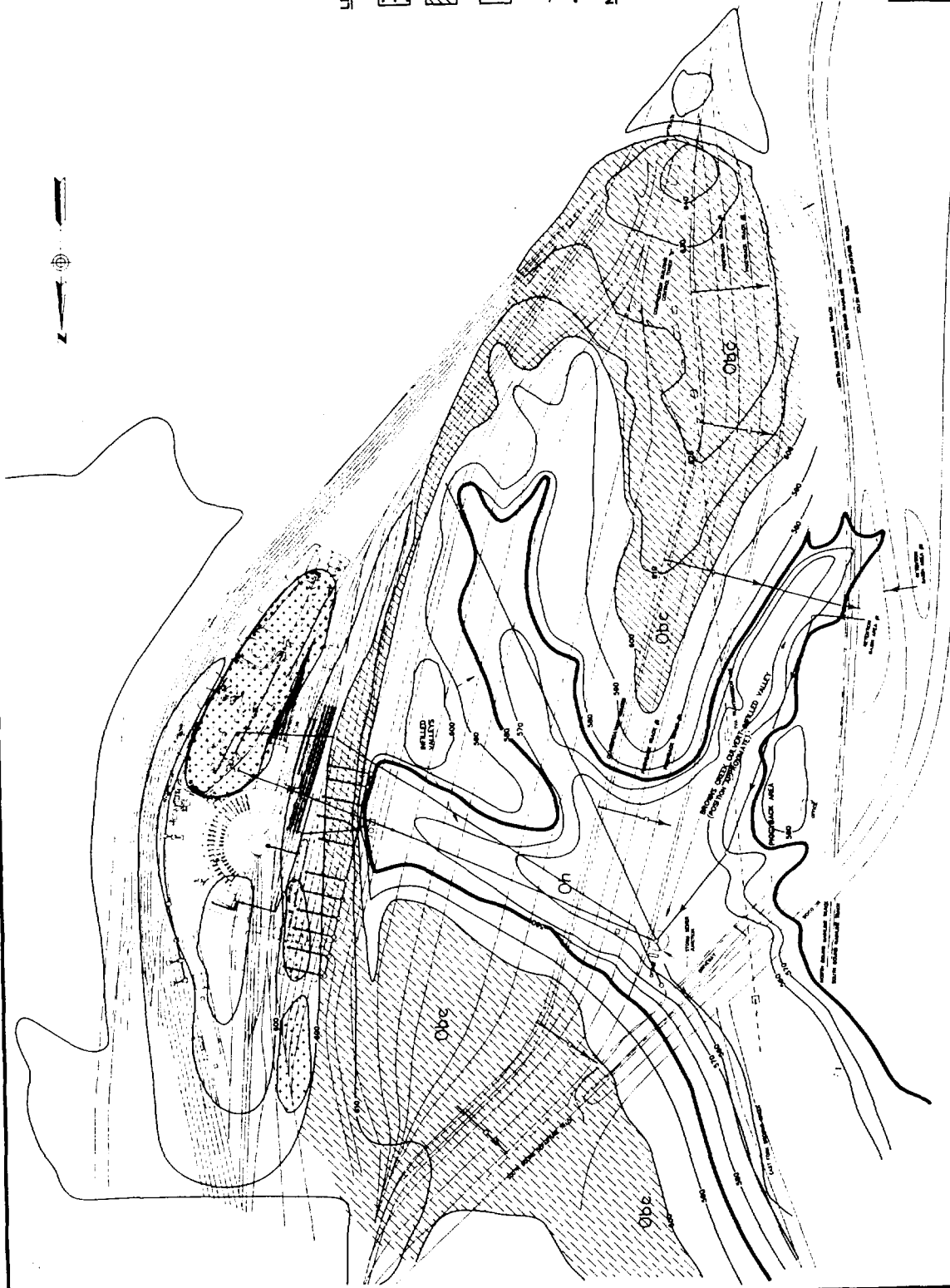


Figure 1. Paint filter test apparatus.

METHOD 9095
PAINT FILTER LIQUIDS TEST

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LEGEND

- INTERPRETED POSSIBLE BEDROCKS
- POSSIBLE NATURAL GROUND SURFACES (CHANGING OVER WEST-CANON LAKSTONE BEDROCK)
- VARIOUS FILL OVER LAKSTONE BEDROCK
- APPROXIMATE ORIGINAL BEDROCK ELEVATION OUTLINE (10 ft INTERVAL)
- WEST-CANON/ARWAT/LAKSTONE BEDROCK FACES

NOTES

2 4 0800



PROJECT NO. 93-4319		DATE 07/09/00	
PROJECT NAME RADNOR YARD WORK PLAN		DATE 07/09/00	
PROJECT LOCATION MARTIN, TENNESSEE		DATE 07/09/00	
PROJECT DESCRIPTION PRELIMINARY SITE GEOLOGY		DATE 07/09/00	
PROJECTED BY GOLDER ASSOCIATES, INC.		DATE 07/09/00	
PROJECTED BY J. J. GOLDER		DATE 07/09/00	

Golder Associates
101, 102nd, New Jersey

FIGURE 2.4-2





**RESOURCE
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2 4 0882
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Respond to: General George Patton Drive

October 28, 1994

Mr. Thomas Roehm
Manager, Industrial Facility Section
Division of Water Pollution Control
Department of Environment and Conservation
State of Tennessee
6th Floor, L&C Annex
401 Church Street
Nashville, Tennessee 37243-1534

RE: Preliminary Remediation Plan
CSXT Radnor Yard, Nashville, Tennessee
NPDES Permit Number TN0064955
RCI Project No. 8-4386.00

Dear Mr. Roehm:

In accordance with the provisions of NPDES Permit Number TN0064955, a remediation plan to address soil and groundwater contamination at the above referenced facility is enclosed. This document is being submitted by Resource Consultants, Inc. (RCI) on behalf of CSX Transportation.

Soil contamination was discovered during a field investigation to characterize soils in an area of planned construction excavation, and reported to your agency by notification letter dated September 30, 1994. The area to be excavated is the location of new diesel fuel storage tanks; characterization of soil was necessary so that proper off-site soil disposition could be arranged.

Subsequent to that notification, on October 6, 1994 free product was discovered in an exploratory well located near the diesel fuel receiving and storage area. Notification of potential groundwater contamination was transmitted to your agency on October 19, 1994.



Mr. Thomas Roehm
Page 2
October 28, 1994

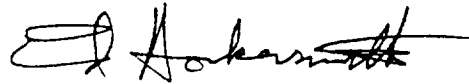
As required by the NPDES Permit, the Remediation Plan provides the following:

1. A description of the initial assessment of site contamination
2. A proposal for assessing the degree and extent of contamination
2. A schedule for defining and addressing the contamination

This plan is designed to be an expandable document, subject to revision with the addition of information regarding the nature and extent of contamination. If you have any questions or require additional information, please contact Clark Causey or Linda Phipps of Resource Consultants, Inc. at (615) 370-6260.

Very truly yours,

RESOURCE CONSULTANTS, INC.



Ed H. Hockensmith, P.E., Diplomate AAEE
Principal

EHH/ccl
Enclosures

cc: Ken Richardson, CSX
Karen Koster-Burr, CSX
Cary Henderson, CSX
Veit Spero, CSX

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